Pacific Discovery

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IN THIS ISSUE: *C. Langdon White* • *Robert T. Orr*

Special Conservation Feature—California's Beaches

Samuel L. Friedman

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A JOURNAL OF NATURE AND MAN IN THE PACIFIC WORLD

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Pre-Discovery

Leading to the main article in the July-August *PD* was a chain of events involving the late war in the Pacific, the Academy's curator of insects, an eminent Philippines anthropologist, a GI in no hurry to get home, and—far from least—the gentle Islanders whose culture is epitomized in the phrase, "Bamboo Literacy on Mindoro."

It seems our curator, then Captain E. S. Ross, commanding an Army malaria survey unit on Mindoro, made visits, in the line of his duty, among a retiring and peaceful people of the hills, the Mangyans, or Hanunoo. He found their ethnology far more interesting than their malariology. Dr. Ross' ethnic activities came to the attention of that dean of anthropologists in the Commonwealth, H. Otley Beyer at the University of the Philippines in Manila. Came VJ-Day, and a certain GI whose name is Harold Conklin decided to be mustered out on the spot, which happened to be somewhere in the Philippines, so he could get on with his career as an anthropology student under the famous professor. Thus he learned of Dr. Ross' sojourn among the Hanunoo, and went there to see for himself these people who were reported to spend their leisure inscribing love lyrics on bamboo in an Indic script descended from Sanskrit.

When Harold Conklin returned to the States as a student in anthropology at the University of California, he got in touch with Dr. Ross, who—as an associate editor of *PD*—persuaded him to write the story of the Hanunoo.

Since his letter from Lagos ("Saharan Contrasts," *PD*, January-February 1949), Borys Malkin has been collecting up and down the Gold Coast and in the Cameroons. Our research associate in entomology and Africa correspondent for *PD* has finally come through with another communiqué, which bears the marks of difficulties with transport and living in general. Dr. Ross and your editor realize, from the depths of our swivel chairs, that we've given our man a tough assignment.

Discovering PD's Authors

C. Langdon White, Professor of Geography in Stanford University, is one to use a title like "Out of This World" advisedly. He refers to the dimension of time, in thus placing the Indians of the Peruvian *sierra,* although in terms of accessibility to most of us his subjects are as far removed from our world spatially as if they lived on Mars.

Dr. White's interest in human geography—the relations between men and their natural environment—has led him to travel and study widely in South America, sometimes conducting field parties of students and teachers. He was visiting professor of geography at San Marcos University, Lima, in 1947-48, and lecturer in geography at the Instituto de Geografia, Lima, in 1948. During these years he traveled over much of Peru by jeep, bus, train, truck, mule, and airplane, studying the human geography of coast, *montaña,* and *sierra,* the latter most intensively.

For a naturalist, vacation may be field trip and vice versa. So when **Dr. Robert T. Orr,** Academy Curator of Birds and Mammals, and his wife camped "On the Lolo Trail" in Idaho last summer, trapping small mammals and preparing study skins blended happily with trout fishing, hiking, and just plain enjoying the outdoors, to make a memorable wilderness experience.

When *PD* decided to have an article under Conservation on West Coast beaches, the search for an author led us to the Los Angeles City Hall door of **Samuel L. Friedman,** Director of Public Relations for that city's Department of Recreation and Parks. His "Beaches—California's Golden Treasure" deals with a broad subject from one very important point of view. There is much more to be said in future articles from other viewpoints. D.G.K.

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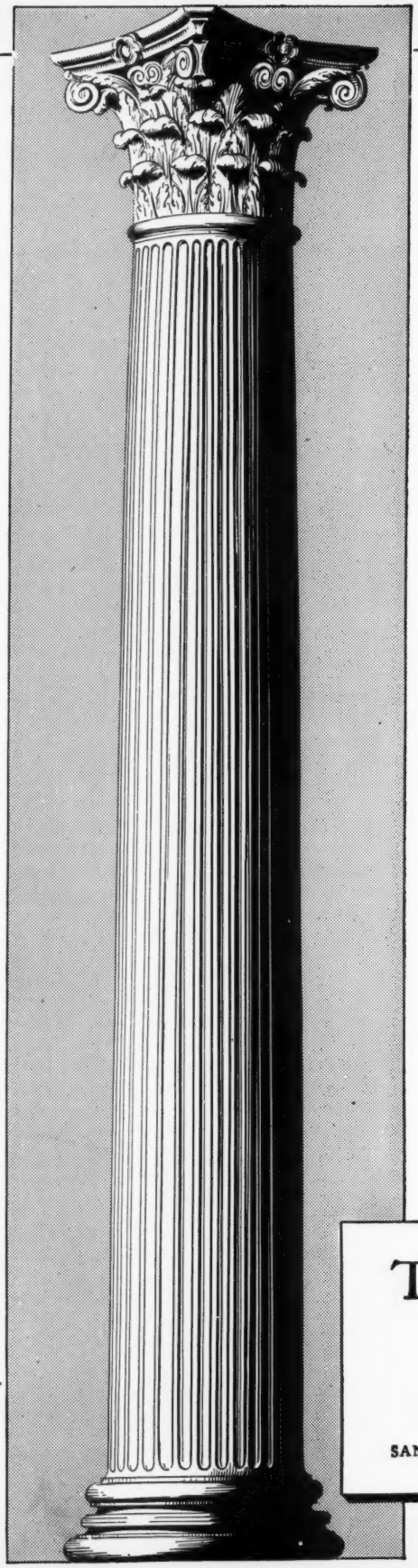

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EDITORIAL *High Country*

On April 8 and 9, 1949, there met at the Hotel Claremont in Berkeley a group of some eighty persons interested in the preservation of the High Sierra wilderness. While the conference was in progress, a lady in the outskirts of Oakland telephoned police that a mountain lion had entered her yard, chased her dog into the house, and was at that moment sitting on her back porch. In the absence of any evidence to the contrary, it seems necessary to assume that the mountain lion was, until distracted into the playful diversion just referred to, on its way to the Hotel Claremont to attend the High Sierra Wilderness Conference.

If any skeptical reader feels inclined to argue that no mountain lion has ever been known to attend a conference in the Hotel Claremont, it can be offered in rebuttal that no conference like this was ever held before. As a matter of fact there are few conferences a mountain lion could attend where he would feel more at home. All of the persons present were familiar with his native habitat and anxious to preserve it in its pristine state. Some, it is true, thought mountain lions a pest because they reduce the supply of deer. Others opined that deer would be a pest without mountain lions to control them. But this debate was minor and incidental to the purpose of the conference.

The High Sierra Wilderness Conference was called by the Sierra Club to consider such problems as camping in the wilderness, wildlife management in wilderness areas, education for wilderness travelers, high country administration problems, trails in the high country, preservation of high country meadows, and—above all—keeping the wilderness wild.

The conference was attended by representatives of the Sierra Club, the High Sierra Packers Association, the U. S. Forest Service, the National Park Service, the National Audubon Society, the Wilderness Society, and the California Academy of Sciences.

It may come as a surprise to most of the readers of *Pacific Discovery* to learn that there is any threat to our High Sierra wilderness. It would seem that this vast and isolated area, remote and difficult of access, would without any special effort on its behalf remain perpetually inviolate. But such is not the case. The High Sierra, like most of the rest of the world, is just getting too populous.

The High Sierra Packers have a serious grazing problem. Their business is taking pack trains into the mountains, and pack animals need food. Mountain meadows are limited in number and extent, and when over-grazed become dusty and useless. There is increasing abuse of these meadows by autoists using trailers to bring their horses into the high country. Once a mountain meadow becomes overused it deteriorates rapidly. Erosion sets in, the water table goes down, forest invades the edges, and presently the meadow disappears. You may think it is all right to have a forest there instead of a meadow, but not if you like mountain meadows, and not if you have pack animals needing grass.

There is also the problem of dirty camps. If you camp once in the High Sierra and leave a dozen cans around your camp site, you may think little of it. But if a hundred campers leave a dozen cans apiece, it is a different story. And with actually thousands of people camping in the High Sierra, do your own arithmetic. Good campers, of course, will bury their cans; but there comes a time when you can't find a new place to dig. One thing seriously discussed at the conference was the practicability of packing out again on mule-back the cans that had been packed in.

Then, with the curious perversity of people who love the out-of-doors, the conference began to discuss how to educate children and young people for wilderness camping. You would think that these people, fond of the high country and anxious to preserve it, would want to keep it for themselves alone. But no! They want to train Boy Scouts and Girl Scouts and Campfire Girls and everybody in general to go out in the wilderness and enjoy its beauty. But they also want to train them to leave the wilderness the way they found it, for the pleasure of those who come after.

The old ideal of camping in the wilderness was to blaze trails, build a lean-to or other shelter, and sleep on a bed of balsam boughs that you cut with your own little ax. The new ideal is to camp in such a way that you leave no traces. The ability and ingenuity of the camper are determined, not by his resourcefulness in building shelters and devising furniture for his comfort or convenience, but by his ability to utilize a camp site in such a way that the next arrival will not know he has been there. If our American people, who are the joint possessors of the High Sierra, gain this ideal, more and more people can come to enjoy the physical restoration and spiritual uplift of camping in the high country.

By the way, what happened to that mountain lion? It disappeared from the lady's porch but never arrived at the conference. We hope it is not lost in downtown Oakland. For as Ike Livermore remarked in commenting on the ways of pack mules, "After all, animals are only human."

R.C.M.

C. LANGDON WHITE Out of This World—THE PERUVIAN SIERRA:

LIVING IN THE ANDEAN HIGHLANDS are the descendants of the great Inca civilization which, at its height, extended from northern Ecuador to middle Chile and Argentina—the "Roman Empire" of pre-Columbian America.

These Indian descendants of the once-mighty Incas live in our time, but they are not, for the most part, of the twentieth century. Theirs is a medieval survival; almost their whole mode of life is of the past—their dress, their homes, their agricultural implements, their system of farming, their food, their modes of transport.

While the Inca Empire was essentially confined to the highlands, it also included the irrigated valleys of coastal Peru. Today, the Indians dwell largely in the *sierra.**

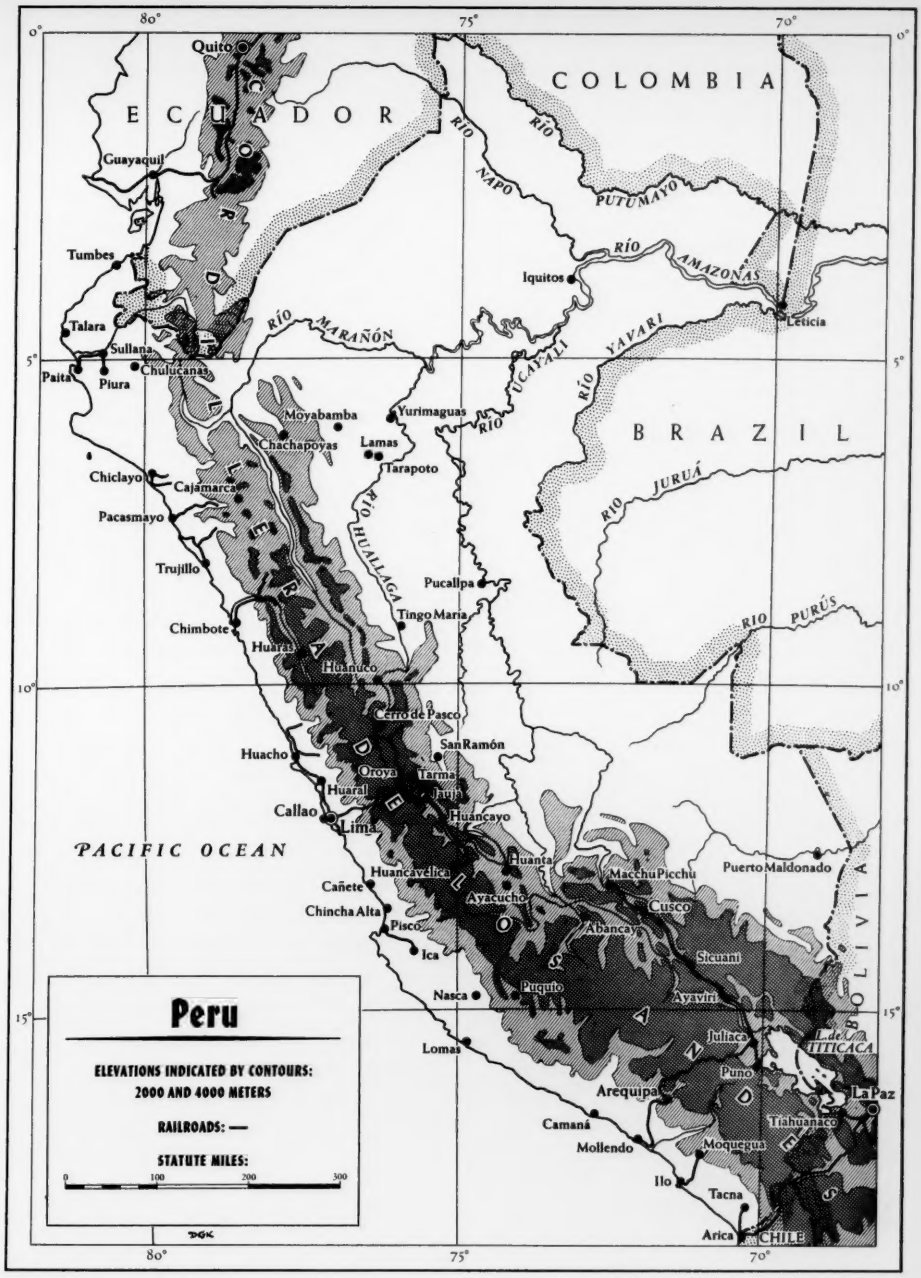
The Sierra: Land of Arrested Development

Peru, as was "all Gaul," is divided into three wholly different parts: the coastal area, the *sierra,* and the *montaña* (rain forest and jungle). This division by nature keeps "Peru divided" and affects the nation economically, politically, and socially.

The gigantic mountain system of the Andes extends the whole length of the country, forms a lofty belt 200-250 miles wide, and comprises about 40 per cent of the nation's area. The usual description of Peru's Andean ranges unduly simplifies their pattern by having them consist of three or four parallel *cordilleras.* Actually, the several ranges are not continuous, but are composed of several discontinuous chains; nor are there mountain knots. The western range contains peaks of 18,000 to 20,000 feet altitude, and forms the continental divide between the small, short, fast-flowing rivers of the Pacific slope and the headwaters of the giant Amazon. Between this range and the *montaña* are other ranges, and between the ranges themselves lie high inter-montane valleys. So complicated have been the upheaval, folding, and erosion in this region that even geologists do not agree as to the actual number of ranges.

The main climatic characteristics of the *sierra* are low precipitation (except on the northern and eastern sides of the mountains), a seasonal rhythm in the rainfall in the central and southern portions, a wide daily range of temperature, thin air, and a

* This paper discusses only the *sierra* of Peru.



A map of Peru. Few countries in the world show such sharp contrasts in terrain, climate, vegetation, and, therefore, in economic activities in such short distances. The sierra (shaded area on the map), comprising about one third of Peru's area, is a world apart; it is densely populater—its people heavily concentrated around such cities as Huaras, Jauja, Huancayo, and Cusco, sparsely scattered in other areas. Where agriculture predominates, in the lower valleys, villages are often close together; in higher, pasture lands, they are widely spaced. Along some 50 short rivers of the coastal belt, population is dense. The montaña, east of the Andes, is largely empty of human beings.

The map is based, by permission, upon the American Geographical Society's Map of the Americas, 1:5,000,000 (1944 ed.). Contour equivalents: 2000 meters—6562 feet; 4000 meters—13,123 feet.

high percentage of clear days. This last results in rapid heating by day and rapid cooling by night. One never forgets the penetrating cold of the Andean night.

Everywhere the rains fall between October and April. The marked contrasts in elevation induce locally great climatic variations. Cuzco receives 34.7 inches of precipitation. At the higher elevations, freezing temperatures may be expected in every month. At Cuzco the mean monthly temperature for January is 54.2°F., and for July 48.1°F. The extreme maximum is 80, and the minimum 28°F. At elevations of 12,000 to 14,000 feet lie the *punas*, which sustain a poor grass vegetation that is devoted to the raising of livestock under range conditions. At such heights temperatures are always cool.

In the upper *sierra* where the air is thin (above 10,000 feet), lowland peoples get mountain sickness (*soroche*). The resident Indians, however,

The Cordillera Blanca, looking northeast from Huaras. With great ranges of lofty mountains whose dominant snowclad peaks rise to heights exceeding 20,000 feet, the Peruvian Andes constitute one of the earth's most majestic land features. Only the Himalayas exceed them in elevation and mass, but not in total length of the system of which they are a part. (Photograph courtesy Servicio Aerofotográfico Nacional of Peru)

are not bothered, since for generations there has been going on here a selection—a survival of the fittest. These people live and raise families at elevations up to 17,000 feet.

The natural vegetation in the Peruvian highlands consists of forests on the east and north; the *selva* or tropical rain forest ascends the lower eastern slopes, but higher up surrenders to a mountain forest of smaller trees.

The greater part of the cold, windswept highlands consists of broad expanses of *sierra* grasslands (much of it *ichu* grass), which appear from north of Huaras, and include almost the whole width of the Andes farther south.

Inca land was and is, then, the lofty area lying between high mountain ranges toothed with peaks above 18,000 feet in elevation. It is cold, quite dry, has few good soils (these are mostly glaciated outwash studded with pebbles and rocks), and is covered to a large extent by a xerophytic vegetation comprising only low grade browse. Theoretically, this environment would appear to be fit only for producing and maintaining a backward, poverty-stricken people, yet it supported one of the world's outstanding early civilizations.

The Inca Civilization

The Inca civilization, which began about 1100 A.D. and lasted until its destruction by the former swineherd, Francisco Pizarro,* started as a small tribe of *Quechua*-speaking llama herders in the cold and lofty *altiplano* of what is now southwestern Peru. The empire reached its zenith under the tenth ruler about 1485-1525. As the Incas began their ascent up the ladder of dynastic grandeur, they emigrated from their bleak home base down into the beautiful, hospitable Valley of Cusco.

No one can appreciate the magnitude of their empire-building unless he views it in the light of geographic conditions. Only by traveling through and carrying on field investigations in the *sierra* can the full impact of Inca accomplishments be realized. Especially does the story unfold as one rides the skyways, noting the hard environment—endless tumbled ranges of mountains with thirsty desert on the west and verdant rain forest on the east. This great area of infinite diversity is divided into various regions and subregions by all but impassable barriers.

The Inca dynasty welded a host of tribes, having diverse languages and customs, into a political and cultural unit of some 10 million people occupying an area that, if superimposed upon the Eastern Seaboard of the United States, would extend from Maine to Florida and from the Blue Ridge to the Atlantic.* The magnitude of this empire-building task almost staggers the imagination.

The Inca civilization was administered from the top by a dictator. The system of government should be considered a benevolent autocracy carried to the point of extreme totalitarianism. The people were in rigid strata, and no one could rise above the stratum in which he was born. All the land was the property of the Inca. Every man's labor belonged to the state except for royalty, priests, sons and grandsons of army officers, males under 25 and over 50, the sick and incapable.

The great weakness was that the Inca was supreme – all powerful – and when the Spaniards captured him (Atahualpa) at Cajamarca, the whole system collapsed, for the subservient masses, unused to thinking or making independent decisions, knew not what to do.

Government was based on the decimal system, the Inca having ten nobles under him, each of these having ten men, and so on down to the last person. So highly organized was it that a constant stream of reports flowed upward and a similar stream of orders went downward. Secret agents circulated everywhere to see that all orders were obeyed and that all work was done. Nothing was considered too trivial to be included; no one dared act without orders—that is, follow his own judgment.

The cultivable land was divided into strips of equal size, each capable of supporting a childless couple. With the birth of each son, another strip was granted. A half strip became available with the birth of each daughter. The rest of the land was held and worked in common to feed the army, the helpless, and to fill public granaries against emergencies.

* Pizarro's conquest of the Inca Empire in 1533 was facilitated by the fact that the Empire had grown too large to be controlled from Cusco. Accordingly, Atahualpa was given the territory of the north with the capital at Quito; Huascar succeeded to the throne at Cusco. But there was jealousy between them; they quarreled, and war began. Huascar was defeated.

* Taking northern Ecuador and central Chile as the Empire's limits and applying the comparison to North America's western edge, we find that the Incas ruled over an area equaling in length the distance from Seward, Alaska, to the Gulf of California and greater in width than the state of California.—Ed.

"It was a planned economy in which demand and supply were carefully regulated."* Drafted labor was used, in great numbers, for building irrigation canals and aqueducts, bridges and roads, for draining swamps, and for constructing buildings. For the leaders, this system assured power, position, and luxury, and for the masses, economic security. There were no rich and no poor.

The Inca Empire and its civilization have vanished, but there is left a great heritage; and the beauties of land and sky remain.

Peru a Center of Domesticated Plants

What is now Andean Peru has long been important in agriculture. The ancient Andean civilizations were the first to utilize several of the principal economic plants of the New World: the potato, tomato, coca, quinoa, and others. It is believed that the pre-Columbian Indians domesticated from 70 to 80 different species of agricultural plants—root and seed crops, fruits and vegetables, pot herbs, condiments, medicinal plants, intoxicants, poisons, dyes, fibers, and so forth.

Despite the fact that this agriculture started from scratch with crude hoes and planting sticks as the chief agricultural tools, a truly scientific agriculture was evolved, including preparation of the soil, destruction of weeds, use of fertilizers, terracing steep mountain sides, irrigation of dry lands, and development of special varieties and strains of plants through selective breeding.

They accomplished all this *without the ox, the horse, or any other beast,* for the one work animal they succeeded in domesticating – the haughty llama—never permitted, in fact has not yet permitted himself to be harnessed for draft purposes.

Hence, the footplow (*taclla*) was used. This consisted of a pointed stick with foot rests and handles, which was guided by the hand. The work of preparing the furrows was done by human strength, the *taclla* not actually turning over clods as our modern moldboard plow does. The footplow penetrated only to a depth of about four inches. Women and boys knelt in front of the plowing men, turning over the sod as rapidly as it was pried loose. This practice with no variations is common in the *sierra* today, though the footplow is now provided with metal. In the thin air, this work is exhausting, and rest periods are the rule. The footplow is well adapted to steep slopes.

* William H. Haas, "The Plateau Indian of South America," *Journal of Geography,* XLV (1946), 248.

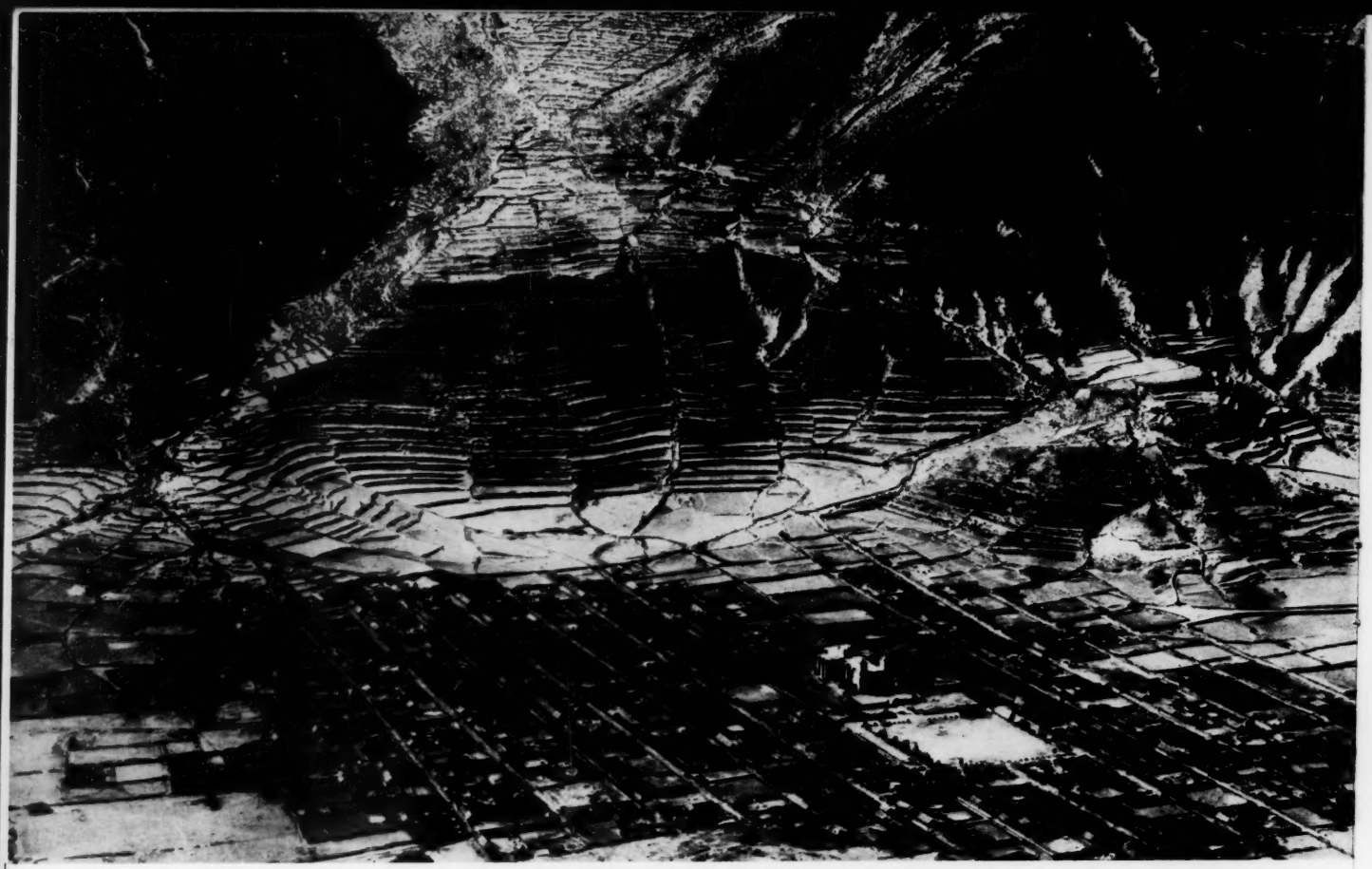
Preparing the land for potatoes. Men break the ground with the footplow, women and children turn over the clods. Peru's small-scale farms are mostly concentrated in the highlands. (Photograph courtesy A. Guillen)

Indian women making chuños—shrunken, corklike, petrified-looking potatoes desiccated by prolonged exposure to the frost of the altiplano. It is reported that "such potatoes will last for years." (Photograph courtesy Runcie)

Other important implements were the hoe and the clod-breaker.

Indian Contributions to Agriculture

If some all-powerful magician could suddenly take from us every crop inherited from South and Central America, the loss would be irreparable. It is claimed by some agricultural historians that five-sevenths of the world's agricultural wealth is of American Indian origin. The early American



Terraces in the Peruvian sierra. Nowhere in the world are there better examples of terrace engineering than here. These terraces are hundreds—possibly thousands—of years old. Here was practiced some of the best conservation farming the world has ever known. Retaining walls were built of huge stones, unsquared but fitted together with great precision. Such works may well be considered among the great wonders of the ancient world. (Photograph courtesy American Geographical Society)

civilizations, including the Inca, were based on a highly developed agriculture, which, in turn, was based wholly on native American plants, not one of which was known in the Old World prior to the voyage of Columbus in 1492. A few of the principal contributions of this region follow:

"Irish" potato, so called, really is not a true potato nor can it claim Ireland as its native home. It was developed in highland Peru some 2,000 to 3,000 years ago from "a wild ancestral plant with a hard, uneatable tuber no larger than a hickory nut." It is now grown around the world but, as a result of selection and breeding, types superior to those of Peru are found today in other countries. As a matter of fact, the progeny of Peruvian seed stock is homeward bound. The Institute of Inter-American Affairs hopes to develop through seed selection and breeding a potato that will give higher yield, better quality—more food for the natives. At this writing Peru cannot supply the potato demand of her own population.

Potatoes are grown in highland Peru today. In the central part of the highland region, Indians are growing the crop at 12,000 feet above sea level, often on mountain terraces, as their Inca forefathers did. They grow an astonishing variety, most of which have never been seen elsewhere—potatoes of all conceivable sizes, shapes, and colors.

One variety of Peruvian potato will withstand a temperature as low as 18°F. Mountain Indians alternately freeze and thaw potatoes till their water is expelled, leaving a shrunken light substance called *chuño.*

Quinoa is another ancient crop of the Andes, and was regarded as sacred by the Incas. In fact, they

cultivated it more generally than any other crop; a part of the harvest was made a religious offering to the Sun.

This grain is a major factor in feeding people where killing frosts are a constant threat. It is claimed that it can stand more cold than any other cereal. Tolerant of light frosts, it does best between 9,000 and 12,500 feet altitude, producing well with even a small amount of rain.

Quinoa grows to a height of about three feet, sometimes reaching eight. When grown for grain, the whole plant is cut and left to dry in the sun for some days, then flailed with a stick. The seeds are cleaned almost entirely by winnowing. Having more than 100 varieties, quinoa is used as food, feed, and as a beverage. *Sierra* Indians eat it cooked, toasted, as *tortillas,* and in soup and porridge. In some parts of the country it is used for making *chicha,* the popular alcoholic drink.

Coca, indigenous to the deep, warm slopes of the Andes, is not a crop of the *altiplano.* Its climatic requirements are much like those of coffee —warmth and moisture and a cloud-shield from the direct rays of the sun.

Grown on small plantations at altitudes up to 6,000 feet, coca is not a food but, to the Indians—both men and women—is just as important, an essential to life. It is a stimulant, and dried leaves have been for centuries a leading staple in internal trade. No Indian will work or travel without his ration of coca, which he mixes with the ashes of quinoa, bones, or shells and perhaps a bit of lime, and chews three to eight times per day. His nervous system is definitely adjusted to the chewing of coca.

It is claimed that chewing coca dulls the Indian's hunger, makes him less liable to *soroche,* and gives him energy for extreme and prolonged muscular exertion. Distances to be traveled are measured, not in miles, but by *cocadas*—a *cocada* being the distance traveled before the need for another chew is felt.

Tomato. In the lower valleys this native crop was highly developed at the time of the Conquest. It is of the small cherry variety and may be red, gold, pale yellow, or white.

Corn (maize). It is not known exactly where in the New World corn was developed,* but it is grown over much of the temperate *sierra* today. It was probably introduced into highland Peru before the Christian era from Paraguay by way of the Gran Chaco, but the potato had largely replaced it in the diet before Columbus reached the New World. Maize is believed to be the oldest of the cultivated cereals, if not of all cultivated plants. In its present form, it could not exist without man, for it has lost its ability to release its seed —a job that must be done by man. It cannot grow wild.

* Whether corn originated and was first domesticated in the New World or in the Old is still an unsolved puzzle. *PD* is planning a series of articles on this subject.—Ed.

Few Domestic Animals

Neither the Inca nor any other American Indian civilization was as successful in domesticating animals as plants. The dog was probably brought from Asia.

The Andean Indian, settling down to a sedentary life, developed for his use only the llama and the Muscovy duck. Most authorities attribute this not to lack of ability on the part of the Indian but rather to the paucity of domesticable animals in the New World; the white man in his more than 400 years has done no better with the material available.

It has already been shown that the llama does not go "all out" for man. Nevertheless, without him and his relatives the great Inca civilization could hardly have existed, for he supplied his owners with wool, meat, transportation, and fuel. Finer and more abundant wool, however, is obtained from the long-coated alpaca—wool that is light, warm, and sheds snow. The vicuña, though often seen grazing with llamas and alpacas, is semi-wild. Its tan wool is said to be the softest known of all animal fibers. Because it has been hunted almost to extinction the Peruvian government now protects it. Efforts are being made also to domesticate the vicuña, and some success is reported with several hundred on an *hacienda* near Puno.

Herds of alpaca and llama are almost the exclusive property of the Indians, who have genuine affection for their animals. The llama, if gently treated, is usually docile and tractable, but at times he may become stubborn. If angered, he will spit in the face of the offender.

Inca Skills

The ancient Peruvians were the most expert weavers the world has ever known. They produced finer and greater varieties of weaving than any other people.

Because of the brightness of textiles removed from burial sites, there has been much speculation regarding the kinds of coloring matter used. It is

reported that indigo and cochineal were most commonly employed. Such primary colors applied to llama wool, already having several natural shades between yellow-brown and black, produced rich maroons, dark blues, olive greens, orange-browns, and other intermediate hues.

Early Andean Indians excelled as stone masons. For a long time, historians attributed the cyclopean structures in southern Peru to the Incas, but it is now believed that before their ascendancy there was a long period of development we call the Megalithic Period. It is possible that some of these structures date back to 1000 B.C.

There are to be seen in Cusco striking multiangular forms of construction, such as in one of the walls of a palace. The outer surfaces of the stones are slightly beveled, but the lines of the actual joints lie in one plane. Many of the stones have rounded corners where they fit against each other, indicating great perfection of craftsmanship; especially is this the case with the blocks forming one corner, where the stones fit together as if shaped from plastic material instead of the hardest syenite or similar plutonic rock. There is even one 12-corner stone which measures 54 inches wide by 48 inches high.

The most stupendous structure, however, is the old fortress, Sacsahuaman, north of and above the city of Cusco. One stone here would weigh from 140 to 150 tons. No one knows how such hard stones were cut, since the Indians had no very hard tools.

The Incas were highly skilled road builders. They laid their roads as straight as possible in an effort to cut down travel time. Almost everywhere in the *sierra* the grades of the highways are steep; these roads mainly served foot travelers—runners and warriors—and llama trains. Some of them were stone-paved; many sections can be seen in use today. Terminus of the Empire's great highway system was Cusco, out of which ran four main arteries.

Probably nothing fascinates the foreigner in the *sierra* so much as the old Inca terraces. In their mountainous habitat, the Indians transformed steep, even precipitous slopes into thousands of tiny level fields. Constructed of stone, the terraces were so well built that, even now, with long neglect, many have outlasted the centuries and are still in use. These terraces are among the finest examples of engineering work man has ever executed. Their walls make beautiful patterns in the landscape. He who travels to Pisac and Macchu Picchu sees innumerable terraces, many still in good repair.

Sierra Indians Today

To millions of people, "Lima is Peru," just as "New York is the United States." Actually, however, the high *sierra* country is the heart of Peru—now as in Inca times. It is densely populated, and it is an *Indian* region.

The Indian population clings tenaciously to its high ancestral land. In few parts of the world is there "so close a spiritual and physical adjustment between a people and their environment. To an extraordinary degree these Peruvian Indians are at peace with their part of the earth."

These people are very much at home in this environment. They suffer from mountain sickness only when they go to unaccustomed altitudes—to the snow line with their flocks—something they do not from choice but from necessity: better pasturage is there.

How They Live

That the mountain Indians are poor there can be no doubt. Their homes, their clothing, their food—all reflect a biting poverty.

An example of the expert stonework of the Incas and pre-Incas in the southern sierra of Peru. All such work was done on a large scale and required well organized labor and great numbers of workers. (Photograph courtesy Runcie)

LEFT: *Typical village scene in the sierra. Characteristically dressed, these, like most Indian women, are barefooted. (Photograph courtesy A. Guillen)*

BELOW: *Never did the author see an idle woman in the sierra. This aged one spins as she walks. Sheep wool is now more commonly used than llama wool. (Photograph courtesy Runcie)*

Most of them live in small, one-story, thick-walled, adobe or stone huts (really hovels), frequently of one room, with thatch roof (often desert grasses), no window, no door in the small doorway (although a stretched hide often serves as door in this lumber-starved land). These huts faithfully reflect the type of climate throughout the region.

Every family spends most of its time outside the house—working and cooking—for warmth is to be found *outside* in the sun rather than *inside* the house. No wonder the Incas were *sun worshippers!*

Clothing is worn for warmth; hence, wool is the textile. Sheep, introduced by the Spaniards, now supply the wool for clothing. Little llama wool is used for this purpose, and alpaca wool is reserved only for the finer garments and for export.

The plateau Indian wears today a costume almost identical, it is believed, with that of his pre-Conquest ancestors.

Feet are often bare, especially among women and young girls. The occasional wearer of shoes may have sandals of leather, but more likely of rubber from old auto tires. Men wear sandals, short black pants, shirts, vest-like jackets, and a *poncho*. This is woven in one piece with square corners and has a hole in the middle for the head; it increases in length with increasing altitude and cold. Nearly all mountain Indians wear suspended from the waist a pouch containing coca leaves. On their heads under the felt hat, they often wear a closely fitting woolen cap.

Women wear a blouse, many, many skirts and petticoats of gay colors—orange, red, yellow, blue, and green—a belt, a felt hat, and a bright, woven blanket slung over the back.* This last invariably has something in it, most often a baby, but perhaps produce or even a live sheep. Few women are ever seen in the *sierra* without a baby. Fashion demands that natives of different localities shall wear hats of different patterns; hence, headgear varies greatly from region to region.

It is in the making of the *poncho* that the plateau Indian expresses his artistic sense. Both color and

* The small daughters are almost exact replicas of their mothers in dress. Turn to the cover of this issue—an Indian family in Pisac. Note also that father and son wear sandals, mother and daughter are barefoot. The details of dress reflect regional differences. This family is wearing costumes straight out of the 16th century.

Winnowing wheat in the northern sierra near Cajamarca. Labor-saving machinery is little used in connection with this crop (see footnote, p. 13). Until a very few years ago, tractors, reapers, combines, and similar modern implements were completely foreign to Peru's wheatfields, and are still rare. Primitive wooden plows, flails, sickles, spades, and oxen comprise the working equipment of virtually all the sierra Indians who grow grain. Harvesting scenes reënact those of Biblical times. Neighbors assist, and harvest becomes a community fete.

Wheat, of course, was not native here, but was introduced by the Spaniards. It is one of the few money crops the Indians grow, most of it going to Lima. (A. Guillen)

design are exquisite—*ponchos* of even the poorest Indians are usually beautiful. Limited as the vegetation of the *puna* is, it nevertheless provides plants from which the women extract dyes in goodly variety.

Everywhere, one sees women industriously twirling their spinning sticks—as they walk along a road, as they tend their flocks and herds, and as they visit. Both men and women do the weaving.

Their religion, outwardly Christian, is permeated by a weird mysticism. On certain *fiestas*, there are processions of masked dancers, often carrying a "wax, life sized, thorn-crowned Christ, blood flowing down the face and sides, occupying the central place of interest. After the procession, the day is spent in bacchanalian and sexual orgies."*

But it is agriculture, the ceaseless struggle to get enough to eat out of their meager soil, that now as under the Incas chiefly occupies the *sierra* people. Most of the Indian families have lived on their present holdings for centuries. By and large, nothing could induce them to move—"even if, as often happens, the land be absorbed by an adjoining *hacienda* and passed repeatedly from one owner to another, the Indian remains on it, being transferred with the soil."† To that soil centuries of occupation have fixed him fast. The whole story here might be different if the *sierra* had not been occupied at the time of the Conquest, but the strongest units were exploiting an environment in which irrigation and coöperative living had long been practiced—just as in Spain. It is little wonder the Spaniards took over easily as the conquering race.

Most of the crops are irrigated—crops that have been grown in the region for hundreds of years. The Indians in the north grow beans, corn, potatoes, and occasionally fruit. Those in the south live almost entirely on the potato, oca, quinoa, barley (introduced by the Spaniard), and a certain amount of maize brought from lower altitudes. In the higher pockets of the south the sole crop is native hay, which is harvested by flocks of sheep, llamas, alpacas, and some cattle. Practically no use is made of milk or milk products. Meat is eaten only occasionally. Hunger is a constant and ever-present enemy.

On the plateau maize is used chiefly, through fermentation, to make *chicha*, a common and cheap alcoholic drink. Purer alcohol brought from the cane fields lower down is consumed in large quantities also, especially during *fiestas*.

* Haas, *op. cit.*, p. 250.

† George M. McBride, *The Agrarian Indian Communities of Highland Bolivia*, American Geographical Society Research Series No. 5, 1921, p. 3. (The facts cited from this reference are just as applicable to Peru as to Bolivia; indeed, the Indians in southern Peru and northern Bolivia are hardly aware of an international boundary.)

Agricultural methods have remained primitive because the average *hacendado* or *patrón,* enjoying low taxes and practically "free labor," can make satisfactory profits without modern agricultural implements.*

Despite an almost animal existence, the Indian and his family remain on their ancestral land even when they no longer own it. It is this issue of the "landless peasantry" that is so serious. The Indians want the larger landed estates divided up, either by nationalization or purchase. Centuries of repression have made them surly, suspicious, and unpredictable. One feels the tenseness — senses that the specter of agrarian revolution hangs over the *sierra.*

It is the Indians, it should be realized, who do the heavy work; yet from their diminutive plots they get only the meagerest subsistence. The pressure of population against the small amount of arable land is severe, and widespread erosion aggravates the problem. Accordingly, more and more steep mountain land must be and is cultivated. The traveler is amazed at some of the things he sees—tiny fields being cultivated on unbelievably steep slopes at really dizzy heights. Time after time, one asks himself: "How do they and their animals get up there?" There are, of course, patches of land so steep farmers cannot use oxen —only the footplow.

Inca and pre-Inca terrace builders constructed stone retaining walls, filled in behind them with soil by hand, led irrigation water by means of aqeducts from terrace to terrace through stone-faced outlets. This system *held the soil!* H. H. Bennett, eminent authority on soil conservation, says that these works have been "the most effective method of controlling erosion developed anywhere in the world, though probably the most expensive so far as labor is concerned."

Disintegration of this highly developed agriculture began with the Conquest and is still going on. In localized examples, some of the most shocking gully erosion in the world may be seen in Peru. A trip from Juliacā to Cusco discloses a constant kaleidoscope of mountainsides cut away by erosion—of land being bled of its life-supporting topsoil. What is worse is that there seems to be no real policy or plan of controlling erosion. The government, with small resources, has problems to wrestle with in every phase of human relations; in fact, official attention has been given to commercial agriculture (mostly in the coastal region), not to the subsistence agriculture of the Indians. The latter are too poor and too ignorant to do much on their own initiative. Except in the *montaña,* a region ill-suited to the mountain Indian, there is no new land to turn to.

Malnutrition is rule rather than exception; the *sierra* is one of the worst fed regions in the world, yielding too little food for its own people. Surplus

* It is indisputably true that agricultural processes are generally simple in the *sierra* because of (1) the small fields separated by stone fences, (2) the irregular contour of the farms, (3) the Indians' desire to do things in the same manner as their forebears did them, (4) the scarcity of draft animals, and (5) the widespread poverty. In the past several years, however, *SCIPA* has introduced more than 100 tractors and 50 threshers and in 1947 tilled 25,000 acres of crop land and threshed 5 per cent of the wheat. The first machinery pool was established late in 1945.

ABOVE: *The highland Sunday market brings out the Indians from near and far in any kind of weather—most of them on foot! Moreover, those not fortunate enough to have donkeys or llamas must pack their wares on their own backs. (Photograph courtesy A. Guillen)*

LEFT: *Main street of Huancayo with its centuries old market.*

is largely unknown. Carbohydrates form the bulk of the Indian diet; the small percentage of protein comes mainly from beans. Sweets are rare indeed. Several years ago Alberto Arca Parró, highly-regarded Peruvian social scientist, asserted: "They (the mountain Indians) do not use sugar, not because they do not like it, but because they are too poor to buy it." At that time, the Indian worker was getting less than 60 cents a day in the equivalent of American money.

The significance of malnutrition and undernourishment is indicated by the shocking death rate among children: between a third and a fifth of all the children born die before they are five.

Endemic diseases are not numerous. Goiter, syphilis, and gonorrhea are common and of long standing; it is thought that syphilis originated here. Smallpox, measles, and influenza have been common since the Conquest. Pulmonary diseases are reported to account for 80 per cent of the deaths in this region.

Market Day in the Highlands

Among Indians of the *sierra* the fair or market keeps the ball of exchange rolling. Probably the most famous fair in all Peru is that held in Huancayo, a city which through the centuries has seen rulers, explorers, conquerors; and liberators pass in procession—the main street of the fair was once part of the imperial highway connecting the Inca capitals of Quito and Cusco. Huancayo, elevation 10,500 feet, is surrounded by one of the most productive agricultural areas in the *sierra*. On Saturday and very early on Sunday morning the Indians, with their laden animals, especially donkeys, stream into the city with every conceivable product. On Sunday, the market place bursts into life. Stalls are set up—four rows of them, stretching the full length of the street. It is impossible to describe the great variety of wares, ranging from corn, potatoes, and coca to live pigs and sheep, to silver of exquisite design and workmanship.

Between 10,000 and 12,000 Indians come to the market. It is the women, however, who do the bargaining, and shrewd they are. Hundreds of items change hands in a few hours. Little actual cash changes hands; barter prevails. Most of these Indians are outside a money economy. Once the business of the day gets under way, the men disappear into the side streets with the donkeys and settle down to the business of drinking *chicha* and chewing coca.

Soon after noon the market is dead, the day's work is done, and the hundreds of Indian families can be seen walking home, taking short cuts over steep trails in many directions. Smaller numbers pile into trucks like sardines in a can.

Indians Not Part of Modern Peru

Traditionally Peru has always been ruled from above. Both Incas and Spaniards found it easy to control the voiceless masses. With few exceptions, the Indians have remained as laborers on the land, tied by feudal institutions.

Nevertheless, ideas have begun to sift into peasant minds in late years—ideas of the Indians playing a role in the life of their country. With literacy increasing, slowly but unmistakably, more Indian leaders will evolve. Probably many years will elapse, however, before the masses will be ready to take a responsible part in government. But the Indians are patient and it seems sure that the suppressed desires of these people will some day assert themselves, however long it may take—possibly and preferably by *evolution*, but more probably by *revolution*.

Summary and Conclusion

Geography, it has been pointed out, has contributed mightily to the fact that the highland Indian of Peru still lives in the sixteenth century. Everywhere throughout the highlands, geography is potent, nature interposing herself into almost all human activities. Even with his few wants, his frugality and thrift, the Indian is ever on the brink of starvation.

He is in this almost hopeless dilemma not because he lacks ability; he has much inherent ability and can learn the ways of the twentieth century. What the Indian needs more than anything is sympathetic leaders who will help him bridge the gap between the centuries.

Present Peruvian economy largely ignores him. Peruvian officials claim that only recently have they realized the major agricultural problem of the nation is the social and economic plight of the 3,000,000 Indian farmers of the *sierra*. The Indian has lost the best of his native culture and has been given very little by the white man to replace it.

It is no exaggeration to speak of the *sierra* as a land of arrested development. Its people are little closer to the twentieth century world than they were in pre-Columbian days. They know there is a different world around them, but they seem pow-

erless to become a part of it. Theirs is a world shut off—they are "out of *this* world," our world.

Finally, the Indian knows that now, as in the whole post-Conquest period, the white man covets his ancestral land—the thing he holds most dear. He is, therefore, highly suspicious. Occasionally, he registers an impressive protest—one so emphatic that it generates in the whites of the *sierra* an "ill-concealed fear of a general uprising."*

* McBride, *op. cit.*, p. 27.

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The cold, disagreeable puna, characterized by perennial herbs, is a drab-appearing region which looks little different in summer or winter. It is basically livestock country. Animals in this view are moving toward a corral made, like most everything here, of stones. (Courtesy Runcie)

ROBERT T. ORR

ON THE LOLO TRAIL

In late June, 1948, my wife and I left San Francisco on a museum collecting trip that was to take us to one of the lesser known pioneer trails of the West. After three days of travel we reached the little settlement of Lolo in the Bitterroot Valley of western Montana. Although we had come nearly one thousand miles, this was not the end of our journey but rather the real beginning. It was here that members of the Lewis and Clark Expedition camped on September 9 and 10, 1805, before crossing the mountains to the west on their famous exploratory trip to the Pacific. They named the spot "Traveller's Rest" and in July of the following year returned to it on their homeward march.

This marks the start of the Lolo Trail which winds its way westward through a hundred miles of mountain wilderness to the lowlands of central Idaho. It was over this same route that Chief Joseph and his warriors retreated in 1877 as they were pursued by General Howard and his men during the Nez Percé Indian War.

The significance of the name *Lolo* is apparently a matter of dispute among historians. According to some it is derived from the Nez Percé word meaning "muddy water." This explanation is rather unsatisfactory since Lolo Creek, even at high water, is a relatively clear mountain stream, originating on the eastern side of the same range that gives rise to the Clearwater River to the west. Others contend that the name of this pass through the Bitterroot Mountains was derived from the Chinook jargon word *lolo*, meaning "carrying" and "back-packing." A third explanation is that it was named for a trapper and hunter called Lawrence who was buried near a creek on the Montana side of the pass. The Indians called this creek "Loulou" after the white man, being unable to pronounce Lawrence. Later it was shortened to Lolo.

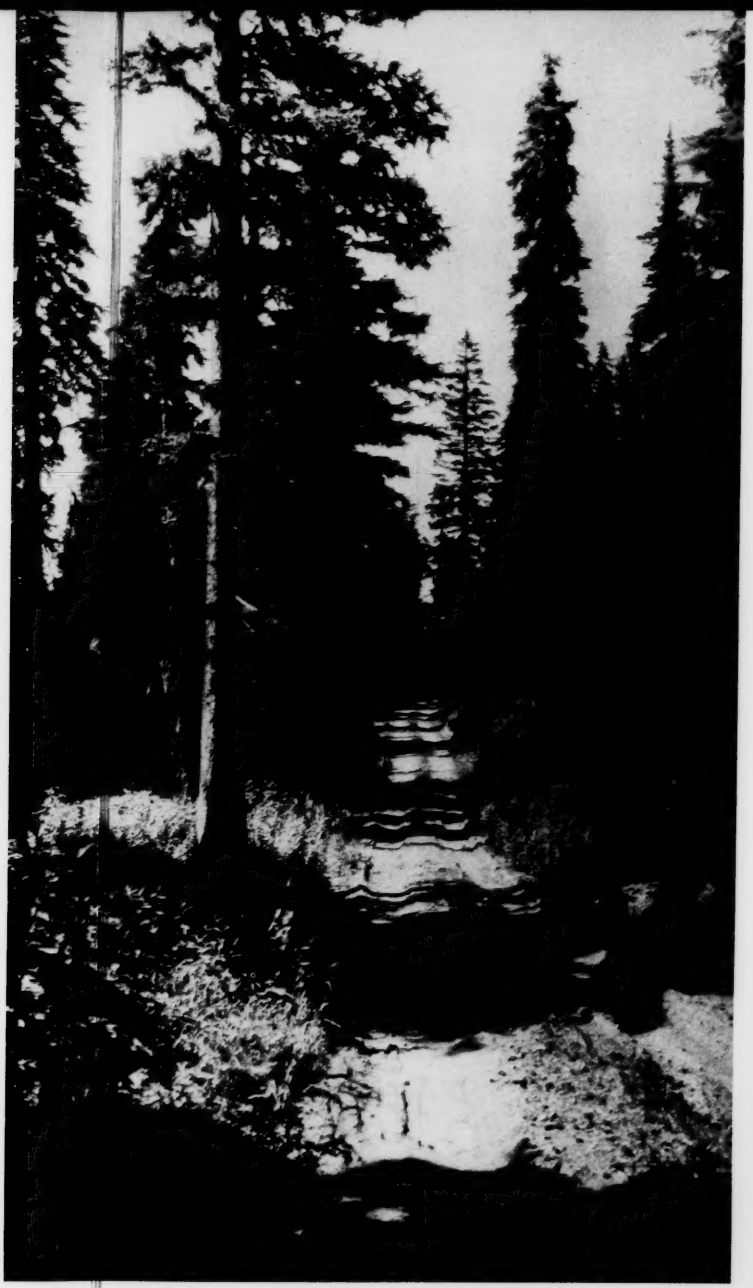
Lolo Pass itself is at an elevation of only 5,187 feet and presents none of the spectacular scenery one might expect after viewing the precipitous Bitterroot Range from the valley at its eastern base. It is, however, the gateway to a vast primitive area that is rich in plant and animal life as well as scenic beauty—an area that has probably been less explored than any other comparable mountainous region in the United States, with the exception of the adjacent Salmon River Mountains.

From our base camp four miles southwest of the Pass, within the border of Idaho, we had access by Forest Service roads and trails to more country than we could possibly hope to see in a few brief weeks. We therefore decided to confine our activities, which were primarily concerned with studying animal life, to the northern portion of the Selway-Bitterroot wilderness area. Perhaps common sense prevented us from establishing ourselves nearer the heart of this region. As it was, a round trip to the nearest gas station behind us required over a half day's time, and ahead of us a warning sign stated abruptly that the next available gasoline was at the far end of 110 miles of low- and second-gear driving.

This wilderness area extends from the snow-capped spires of the Bitterroots west through much of the lower but vastly more expansive Clearwater Mountains, and south from the vicinity of the Lolo Trail to the Salmon River Mountains, bisected only by the Nez Percé Trail. To the lover of nature it offers many attractions. There are thousands of square miles of virgin forest composed of Engelmann spruce, Douglas fir, grand fir, alpine fir, white pine, lodgepole pine, yellow pine, western red cedar, western larch, and other conifers. These beautiful stands of timber with their dense undergrowth of shrubs and ferns are interlaced with game trails, small and large.

To us, much of the charm of this country lay in its essentially primitive state. Far behind and soon forgotten were hum of saw mill, signs of erosion, problems of water pollution, and other evidences of human development associated with many forest areas elsewhere. Here the gentle murmur of a small stream might be interrupted by nothing louder than the resounding slap of a beaver's tail, or the stillness of the forest broken only by the *whirr* of the wings of a grouse. More than once after dark mink came into our camp, attracted no doubt by the odor of freshly caught rainbow and cutthroat trout.

Before we had lived here many days we became acquainted with nearly thirty kinds of mammals that were to be our principal companions for a number of weeks. Our favorites, however, were neither large nor unusual. They were three young jumping mice that my wife captured in a patch of wild strawberries. The red juice on their faces and paws revealed their choice in food. After this the gathering of berries became a regular part of our



Lonely Forest Service roads are used by elk and bear more often than by members of the human species.

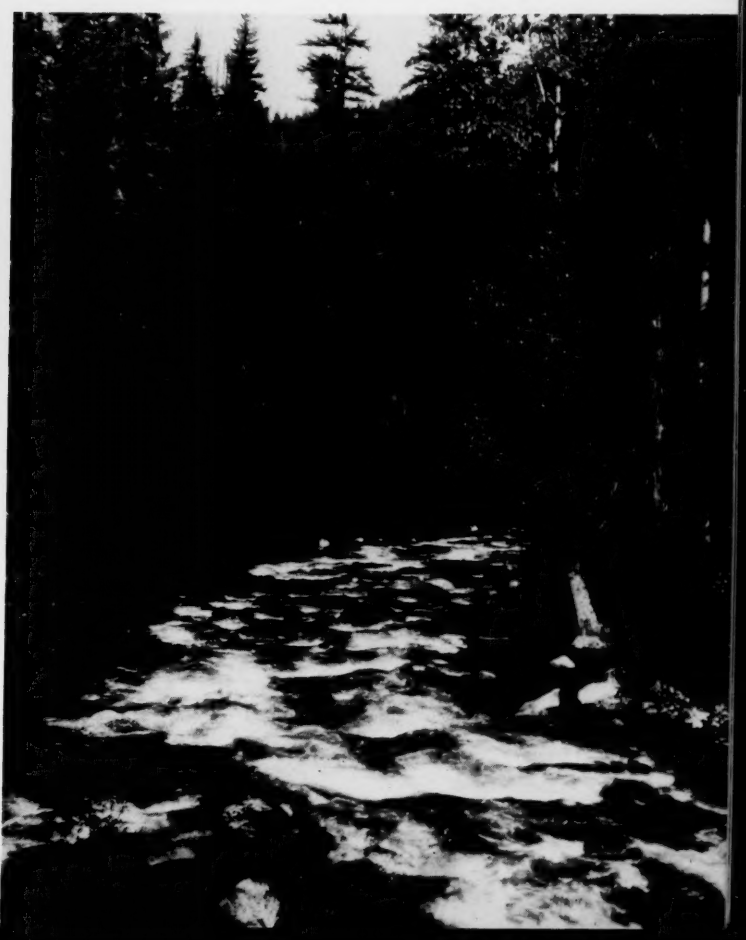
daily routine. Zape (derived from his generic name *Zapus*) was the tamest, but unfortunately the weakest of our three pets. Despite all the care bestowed upon him, including the use of a chemical hot-water bottle and the last of our evaporated milk, he failed to survive. His two relatives thrived, however, and later made a successful journey to San Francisco.

Photographs by the Author

Each morning within a few hundred feet of our camp we found fresh tracks of elk and black bear. Although bears never bothered our larder we did have some conflict on our trap lines. One old bruin persisted in robbing our marten sets along the top of a nearby ridge. We maintained our patience as long as was reasonable and repeatedly changed the position of our traps. Nevertheless, he had become so used to the tidbits of bait that, with his keen sense of smell, he seemed to have no difficulty in finding these new locations. Finally, we set a trap for him baited with two nice porcupine hams. The next morning as we approached the point of battle we found the forest floor torn up as though a bulldozer had been through during the night. The felled pine which had been heavily wired to the trap as a drag had snapped like a toothpick as soon as it wedged between two trees. In the unnatural stillness which seemed at that time to pervade the forest gloom my "better half" decided we would not trail our enemy. Needless to say, our traps were not again bothered.

Throughout parts of this region there are great scars, the product of forest fires of years past. On

Many mountain streams wind their way through dense forests of pine, fir, and spruce in the Selway-Bitterroot wilderness area.



A collecting trip means work from dawn to dark. After the day's catch is brought to camp each animal is weighed, measured, skinned, stuffed, then pinned to a drying tray. This picture shows the author preparing a study skin of a marten.

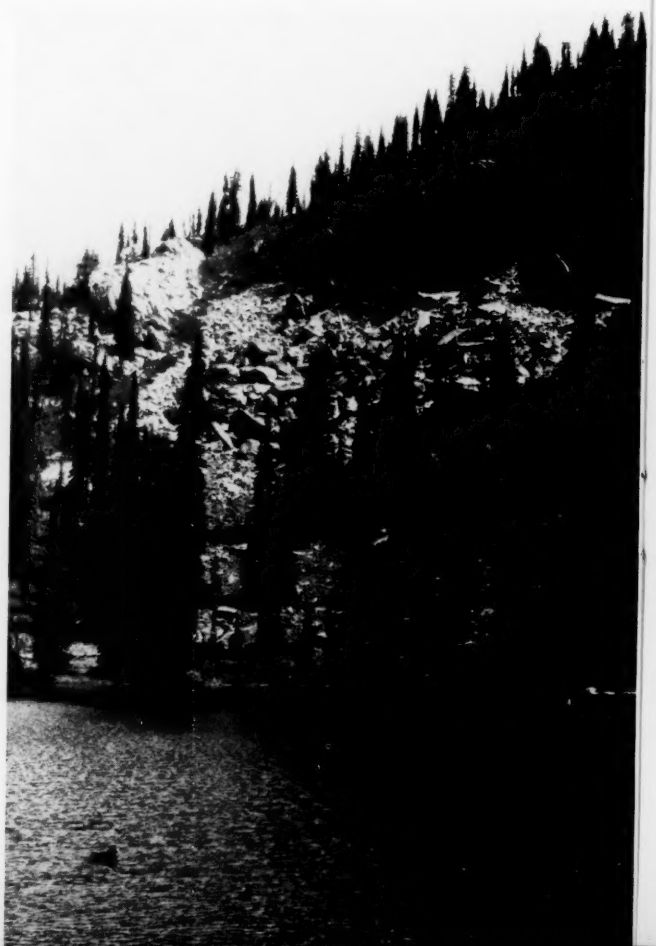
August 20, 1910—a date memorable to the older residents—one of the greatest fires in the history of North America became a terrifying reality, consuming millions of board feet of timber as well as countless animals and many human beings. After a long, dry spring and a summer unbroken by rain the many small smoldering fires started by lightning storms were whipped by freak cyclonic winds into a vast inferno that in forty-eight hours covered an area one hundred and twenty miles long and from twenty to thirty-five miles wide. Blazing embers fell far to the eastward in Missoula, Montana, and days later ashes floated down in the streets of St. Louis, Missouri. Seventy-four men lost their lives in this great holocaust which did not completely die out until the autumn rains came in September.

Other large fires, such as the Pete King in 1934, have taken their toll but none like that of 1910. Today these wounds are slowly healing. The daily drone of the air patrol and the knowledge that an efficient Forest Service with its paratroopers is ever on the alert lead one to hope that such catastrophes will not recur.

Nevertheless, one must give the Devil his due, as the saying goes. Such fires, though they despoil the landscape of its beauty and wreak sudden destruction on plant and animal life, do ultimately benefit certain species. Burned areas in these mountains are rapidly invaded by brush which favors the increase of certain species of animals, notably mule deer and elk. Some authorities on game management have gone so far as to say that fires have been responsible for making this region one of the finest elk ranges in the United States during the past twenty or thirty years.

Elk, deer (both white-tailed and mule), and bear are not the only big game of which this country boasts. Although the caribou are now gone, there are still small numbers of moose, and mountain sheep and goats live on the higher peaks. Though we scanned many tall crags with our field glasses we failed to get a glimpse of these alpine climbers. Our efforts were nonetheless sufficiently rewarded by the sights and sounds that one experiences at timber line. There were slopes clad with velvety mats of heather interrupted here and there by wavy plumes of squaw grass; from talus piles came the faint bleats of conies; and the mountainsides echoed with the raucous calls of Clark nutcrackers—birds named, incidentally, after that intrepid explorer William Clark, co-leader with Captain Meriwether Lewis of the exploring party which passed through here almost one hundred and fifty years ago.

When August was nearly upon us it was with reluctance that we broke camp for the inevitable return to highways and cities. We regretted leaving everything except those diminutive torturers, the "no-see-ums." Each day in the early morning and evening hours vast numbers of these tiny



 Close to timber line in the Bitterroot Mountains the glacial basins are dotted with many small lakes.

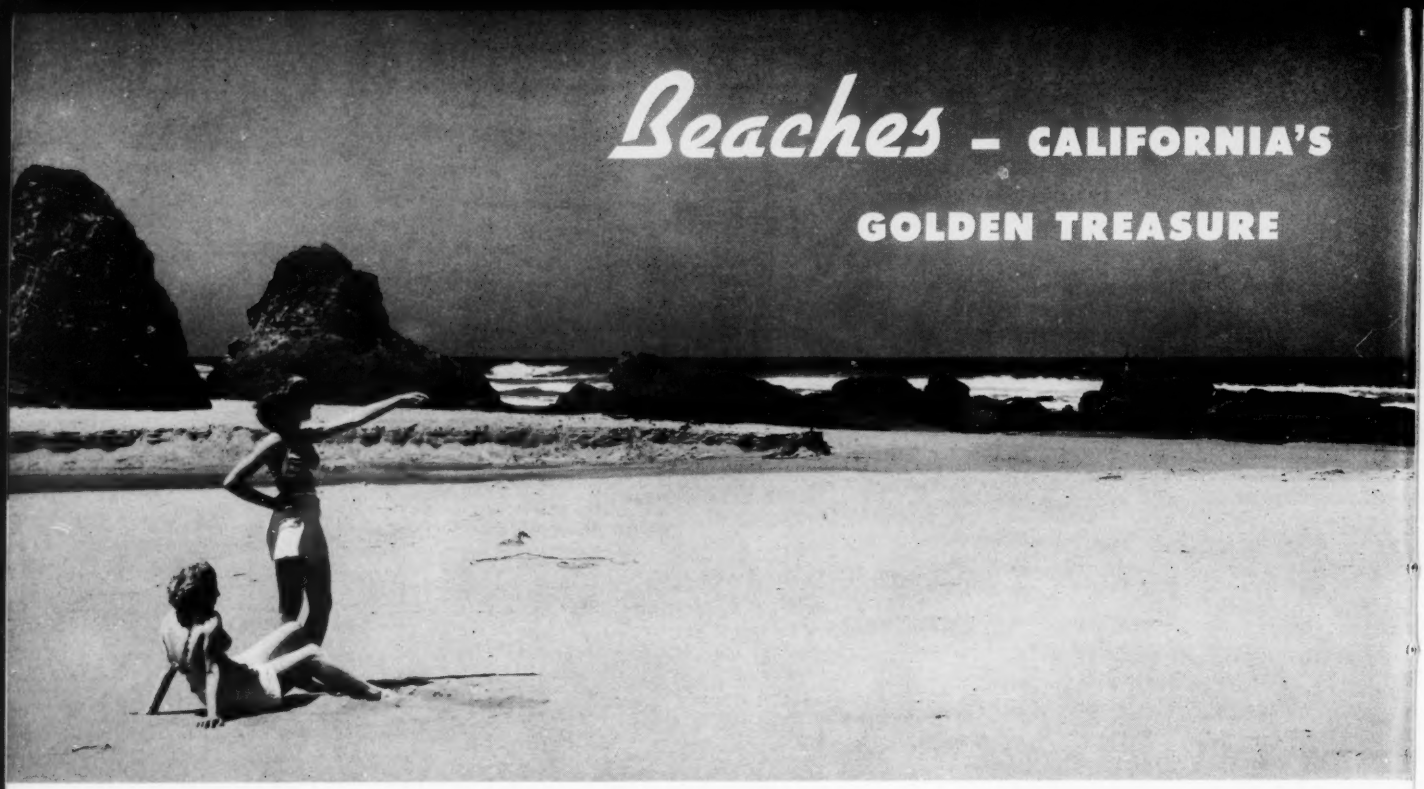
Great forest fires in years past have left destruction in their wake. It will be a long time before such barren wastes with their charred and ugly snags standing like black tombstones are succeeded by lush forest growth.

In contrast to those areas denuded by fire, much of the Selway-Bitterroot region is heavily timbered. Dense undergrowth of shrubs and ferns adds greatly to the beauty of these forests and provides food and shelter for many different kinds of animal life.

gnats, whose bites are so irritating, had tried to drive us from their country. By now their stings are long forgotten, and we keep only the pleasant memories that one is certain to gain from a summer spent in a mountain wilderness—recollections of swift-flowing streams stocked with trout, of forest trails, of alpine lakes, of glowing embers in the campfire after dark.

In many of the lakes and streams of Idaho the fisherman can be certain to catch his daily limit of trout.

Beaches – CALIFORNIA'S GOLDEN TREASURE



A beach in Mendocino County. (Courtesy Redwood Empire Association)

SAMUEL L. FRIEDMAN

THE GOLD AND SILVER which the Argonauts came seeking in California's mountains in '49 were the foundations of the state's early prosperity. Yet the gold and silver in the hills have proven less valuable to the state than the gold of the beach sands and the silver of the surf along California's shores. Only in comparatively recent times has this fact been made clear. But now that it is known, the cities and counties and the state of California have awakened to an understanding that, in the unlimited recreational possibilities of the seashore, there is a treasure of incalculable worth, not to be measured in dollars alone.

The awakening of interest in California's shoreline has come none too soon. Already, great and perplexing problems are assailing the state and its political subdivisions in dealing with heavy use of existing ocean frontage, exclusion of the public from privately controlled areas, the need for development, automobile traffic and lack of parking space, and many related questions.

It is high time for citizens of California to take a careful look at the state's greatest single recreational asset—its threshold on the Pacific Ocean. (Many of the general observations and principles advanced here might well apply also to California's sister states of Oregon and Washington.)

Front Door to the Ocean

California's shoreline of 1,130 miles is the longest of any state in the Union. Coupled with the no less spectacular Oregon-Washington coast line, it is the front door to the ocean for virtually the entire western half of the nation. Nevertheless, speaking for California, there was not until fairly recently much unified thinking about this coast line as a whole. Such action and planning as progressed was purely local, to the credit of cities, counties, or private agencies. Since there are fifteen California counties which face the Pacific, containing among them a very large number of cities and beach communities, obviously no general pattern could begin to emerge until people raised their sights along the whole coast from a statewide viewpoint.

Of the California shore front, only about 268 miles or a little more than 23 per cent is publicly owned, which means that people generally

"The gold and silver in the hills have proven less valuable to the state than the gold of the beach sands and the silver of the surf along California's shores. . . . .
In the unlimited recreational possibilities of the seashore, there is a treasure of incalculable worth, not to be measured in dollars alone."

Even an ordinary day at the State Beach north of Santa Monica taxes parking space provided. On crowded days facilities are obviously unable to meet the demand. (Pacific Press Photos)

can be shut off from the other 862 miles at the will of the private owners of that frontage. Of the frontage in public hands, 116 miles is owned by the Federal government and is primarily set aside for lighthouse reservations, military or naval establishments, or other uses which tend to bar citizens from their ocean.

From the Mexican border north to Point Conception, fifty miles northwest of Santa Barbara, long stretches of sandy beach predominate. From Point Conception to the Golden Gate, the beaches are in shorter stretches bounded by rocky cliffs and promontories. From the Golden Gate north to the Oregon line, sandy beaches are few in number, but the scenery of this rockbound coast becomes increasingly bold and spectacular. There is, of course, a great variety of climates, from the warmth of the south to the cool breezes of the north coast.

On this long stretch of coast, famous explorers of the past have left their impress in the form of place-names. Cabrillo Beach at San Pedro is named for Juan Rodríguez Cabrillo, who first set eyes on the California shore in 1542. Drakes Bay is named for Sir Francis Drake who passed that way in 1579 and may have anchored there; Vizcaíno named Monterey Bay in 1602, in honor of the Count of Monterey, then Viceroy of New Spain.

Private Ownership vs. Public Need

California's shores had been more or less taken for granted through all the early years of the state's development. People knew they were there, visited them whenever they could, and assumed they would always be open and available to the recreation-seeker. Population growth, which now sees the state's total number of residents pushing toward the 10,000,000 mark, has forced a change in this laissez-faire attitude. There has been an increasing tendency on the part of private persons to mark off pieces of the shoreline as their very own, build fences, and exclude other citizens and their families. Hit-or-miss development has virtually ruined long stretches of fine shoreline, and oil drilling, sewage pollution, and unsightly shacks have added to the desecration. "Keep off" signs and houses, blocking access to the beaches where people formerly played in blissful ignorance that

they were on privately owned soil, have awakened the public at last to the need for action.

On top of this there has been tragic shortsightedness on the part of some state agencies, notably the State Highway Department which, in buying rights of way for ocean front highways, all too frequently neglected to acquire public ownership down to the high tide line. In many cases narrow slivers of private property were left between the state highway and the ocean on which have sprung up like dragon's teeth whole rows of private dwellings, hot dog stands, gas stations, and other structures which effectively block off the people from their own ocean.

First awakening to the need for public ownership of the shore front can be credited to local government jurisdictions, the cities taking the lead, followed by counties. In the larger metropolitan centers such as Los Angeles, San Diego, Long Beach, and San Francisco, municipal ownership of beaches dates back several decades. It provides a beginning point for the movement to put more of the ocean front under public ownership. Similar movements on the part of such counties as Los Angeles and San Mateo added impetus to this effort.

Shell Beach, Tomales Bay, near Inverness, Marin County. This tiny beach is crowded on sunny week ends and holidays. (Photograph by Woody Williams)

Volunteer organizations and associations have also been active in promoting the idea of public ownership and public protection of the shores. In 1935, the Shoreline Planning Association was started in Los Angeles for the purpose of furthering public ownership and arousing public interest in seashore protection. This Association has since spread its coverage and become a state-wide organization whose influence has been felt in the many advances made by local agencies and the state toward meeting the need for more and better public beaches for California. Another volunteer agency, the American Shore and Beach Preservation Association, has taken the lead in grappling with erosion problems, and its deep interest in California and valued assistance in obtaining Federal aid dates back to 1937, when the Association held its national conference in Los Angeles.

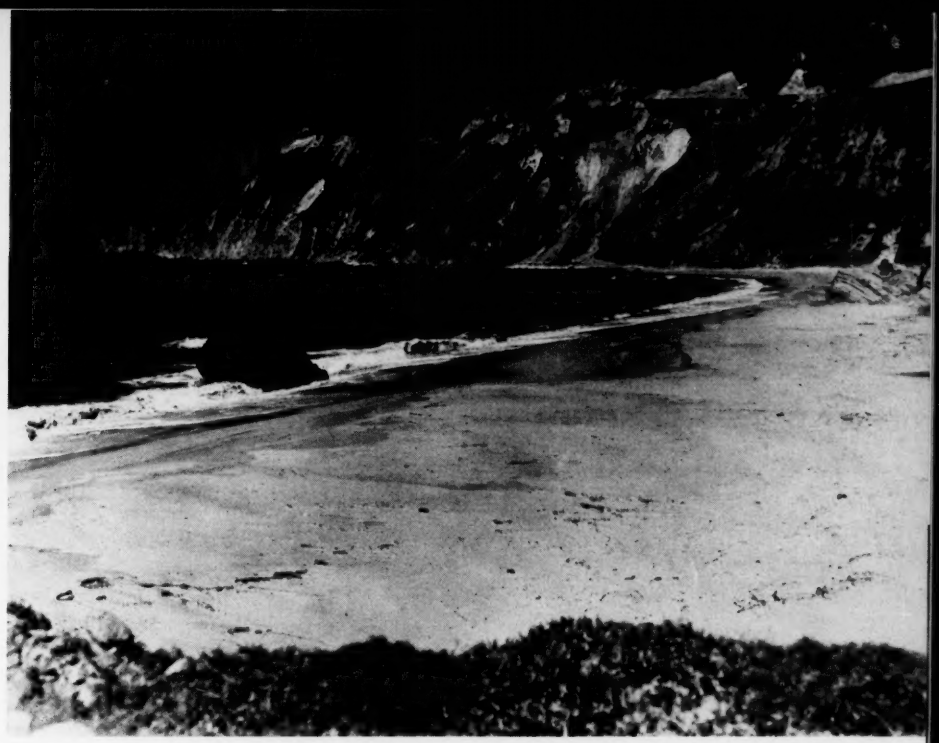
Beaches are a State Concern

The entrance of the State of California into the picture has served as a tremendous stimulus to the entire movement. State interest in beaches, oddly enough, grew out of the state's concern for its forests. As a result of agitation spearheaded by the Save-the-Redwoods League, the state began the acquisition of fine sections of forest lands and turned them into state parks. To conduct this program and plan for the operation of the new parks, the State Park Commission was established. It was a logical extension of the functions of this commission to concern itself with beaches, since they too could be looked upon as potential state parks. After considerable urging, primarily from the beach-minded areas of southern California, the State Park Commission projected itself enthusiastically into the problem of beach conservation as a parallel effort with forest conservation. To implement the planning of the State Park Commission, the Division of Beaches and Parks was established under the State Department of Natural Resources, and has now become a very important arm of state government.

Under the new state-wide approach to beach acquisition and conservation, the following advances have been made in recent years:

(1) Substantial funds were set up for beach acquisition, culminating in an appropriation of $10,000,000 a few years ago to enable the state to acquire large and important stretches of ocean frontage.

(2) The principle was established that funds



Beach at mouth of Little Sur River on State Highway 1, fifteen miles south of Carmel. For nearly 100 miles along this part of California's coast high mountains plunge steeply into the surf, with little space for beaches. There is sharp need for keeping open to the public such beaches as exist on this ruggedly scenic shore.

derived by the state from oil drilling in state tidelands should go, in the main, to support the state's beach and park program. From these royalties 70 per cent now goes into the beach and park fund, this percentage yielding $3,744,999 in 1947 and bidding fair to go higher in succeeding years.

(3) The state has committed itself to a policy of beach acquisition under a ten year program launched in 1941, through which the state is joining local communities and counties in acquiring beaches on a matching basis.

(4) The coördination of local and county plans for beach acquisition and development is being effected by requiring of each county that wishes to participate in the state acquisition program a master plan for the development of its own beaches which is coördinated with the state master plan.

County Plans

Under the state's present program for acquiring beaches through a fifty-fifty matching arrangement with cities and counties, using the $10,000,000 fund referred to above, many fine stretches of ocean frontage have been acquired or are in prospect of acquisition. Some are mentioned below, as outlined in county master plans:

Del Norte County: Pebble Beach Recreation Area—3.1 miles of rocky bluffs, promontories, and sand beaches.

Mendocino County: Establishment of a state park from Pudding Creek to Seaside, with almost 10 miles of scenic coast line.

Sonoma County: Historic Fort Ross Area, and the Jenner Area at the mouth of the Russian River—each having about three miles of ocean frontage.

Marin County: Tomales Bay, Bolinas Lagoon, and Paradise Cove are three projects which would provide an aggregate of about five miles of ocean frontage and some two miles of lagoon and bay frontage, with many sheltered coves and sandy beaches.

San Mateo County: Various acquisitions aggregating almost 10 miles along Half Moon Bay.

Monterey County: Various acquisitions along Monterey Bay and south of Carmel, aggregating more than 36 miles.

San Luis Obispo County: Pismo Beach acquisitions of about three miles, and about a half mile along Avila Beach.

Santa Barbara County: Addition of about eight miles of beach in the Santa Barbara, Carpinteria, and Summerland areas.

Los Angeles County: Acquisitions with state aid will add to public ownership some four miles of beach frontage along Santa Monica Bay in the city of Los Angeles and other communities. This acquisition program, however, is considered only an initial or first priority project. Another 7.5 miles of beach are earmarked for acquisition in a second priority, and about 19 more in a third priority, with the ultimate objective of acquiring all privately held beach frontage in Los Angeles County for public ownership.

Orange County: Approximately two miles between Huntington Beach and the Santa Ana River plus other frontage in Newport Beach.

San Diego County: Beach frontage in Pacific Beach and La Jolla, Imperial Beach, San Marcos Creek, Encinitas and Cardiff, aggregating more than five miles.

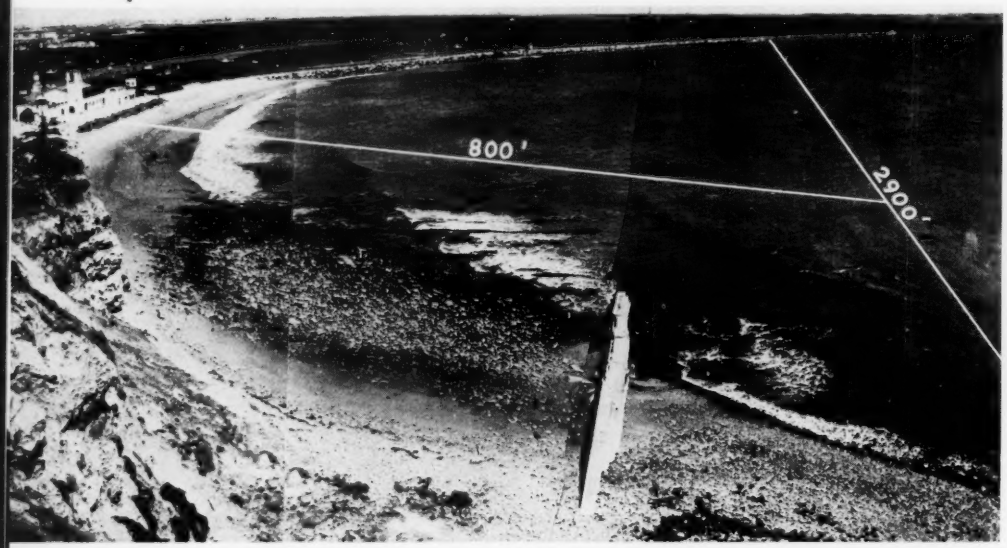
Recreation Development

While acquisition of beaches has been and still remains a primary objective, the problem of development closely follows it in importance. Increased use of beach areas has brought into sharp focus the need for development and awakened many civic leaders to the fact that very large sums of money will be required for engineering plans and designs, for the widening of narrow beaches through sand fills, for the dredging of silted bays and inlets, and for the construction of access roads, parking areas, bath-houses, playgrounds, camp grounds, and other recreation facilities.

Most work in this direction has been done by local governmental agencies, the cities and counties. The state has done some work in the development of beach parks and in the construction of beach camp sites and sanitary facilities. The state has been criticized in some quarters, however, for its failure to do much more than acquire beach areas and then look for some local agency to operate them without further state funds for development or operation. Hope that the state may provide major funds for development of the beaches it acquires is seen in the recent introduction in the State Legislature of a bill seeking an appropriation of $15,000,000 for developing the state's beaches, aquatic parks, and marinas. Should this bill be adopted, California will make new history in the rapid improvement of its treasure of sandy shoreline.

Work in Progress

Thus far the cities and counties of California have a better record than the state for development of beach areas. This is indicated in a brief examination of current major development projects, all of which are spearheaded by local groups.



Cabrillo Beach, Los Angeles City recreation facility at San Pedro Harbor, has been greatly widened and extended through a sand fill using materials dredged from the outer harbor. Outer limits of the new fill are shown by the white line marked "2900 feet." The line "800 feet" shows greatest width. The extension trebles the recreational capacity of this beach. (Photograph Los Angeles City Recreation and Parks Department)

One of the most ambitious of these is the Los Angeles City plan for development of the shoreline of Santa Monica Bay from Topanga Canyon on the north to El Segundo on the south, excepting that part of the coast which lies in the city of Santa Monica. This would include all of the Santa Monica Bay beach frontage of the city of Los Angeles, totaling some 10 miles. The program calls for systematic widening of this entire beach and installation of shore-front roads, parking areas, bath-houses, playgrounds, picnic grounds, etc., and for landscaping—plans which, if carried out, will create one of the nation's most impressive ocean front developments. Tied in with the project is a proposed great yacht harbor suggested for the lowland area lying between Venice and Playa del Rey, which would be known as the Marina del Rey.

Evidence of the city's determination to carry

through the huge project is found in steps already taken to set the program in motion. The widening of a very great section of the beach included in the proposed Santa Monica Bay plan is already an accomplished fact. Six miles of Los Angeles beach north of El Segundo has been widened from about 165 to 600 feet with sand pumped from the site of the city's new sewage treatment plant at Hyperion. Another great fill has been completed at Cabrillo Beach adjoining the Los Angeles Harbor breakwater by means of sand from Federal government dredging operations at Los Angeles Harbor.

One of the biggest projects of its kind along the Pacific Coast is under way at San Diego, where the great Mission Bay development has been launched with funds provided by the city, state, and Federal governments. The Federal part of the job calls for construction of a flood control channel to divert the San Diego River, which now empties into Mission Bay, and carry it directly into the ocean. This is expected to eliminate the silting of the bay by the river which in the past has brought down sufficient materials to choke the bay almost entirely and leave very little usable water area. The city's part in the program consists in financing the removal of millions of cubic yards of sand and silt from Mission Bay in order to open it up to boating. These dredged materials are being deposited at strategic points along the bay shore to create new sand beaches and recreation areas in the form of islands and peninsulas. San Diego will thus obtain a 3,600-acre recreation and aquatic park with 1,900 acres in water area and 1,700 in beach and park area.

A great development has also been discussed for the southeast shore of San Francisco Bay. The city of Alameda and private interests are considering the South Shore Plan for the reclamation of bay tidelands and the construction of a freeway flanked by a long sandy beach, and the development of Bay Farm Island with a shore of sand beach, a yacht harbor, and park and recreation areas. Oakland has plans for a marine park beach and yacht harbor along the shore near the Bay Bridge terminus.

In Mendocino County the State Park Commission has been offered 17,000 feet of county beach north of Fort Bragg, to match land the state will purchase at Cleone Point.

The city of Santa Barbara has shown what can be done with a widened public beach. The municipal swimming pool and other facilities are beautifully arranged to serve the recreational needs of large numbers.

Diminishing Beaches

While acquisition and development have been considered paramount, other major questions affecting the beaches remain to be solved. For one, there is the problem of erosion control which is one facet of conservation. California's beach areas, while seeming permanent enough, do not always remain static. Ocean storms, currents, and waves cut away beaches and replenish them, changing their contours. Sometimes beaches disappear entirely under the battering of the ocean's forces. Deep submarine canyons such as lie off Redondo, Point Mugu, Hueneme, and Carmel, some as much as 3,000 feet wide and 900 feet deep, act as funnels allowing heavy ocean swells from distant storms to pour water with great force against the beaches and gouge them away. In periods of drouth rivers and creeks bring fewer materials

LEFT: *Air view of Mission Bay, San Diego, with part of Ocean Beach in the foreground. Currents at the mouth of San Diego River have since destroyed two stretches of this sandy beach which forms a 2½-mile rampart between Mission Bay and the Pacific.* BELOW: *A more recent view shows how sand has been dredged out of the silted areas in the bay to build up new white peninsulas and islands. Public parks and recreation centers will be developed on this new land.*

down to the shore to replenish sands washed away by the ocean — another factor in diminishing beaches.

Help toward solving erosion problems is available, however, through the Federal Beach Erosion Board which will make studies and recommendations at the request of local authorities. The State of California, moreover, in 1943 provided for a beach erosion engineer in the Division of Beaches and Parks to study methods of dealing with coastal erosion.

Problem of Pollution

Another grave problem that has vexed the people of California and caused many of them to ask indignantly, "Why has such a thing been allowed to happen?" is the serious pollution of the ocean and the beaches which has resulted from sewage, from indiscriminate oil drilling, from the dumping of bilge by coastal vessels, and from other careless acts of man. The sewage problem has been an especially big headache because the Pacific Ocean for years has had to serve as a cesspool into which have been spewed vast quantities of waste from the cities and towns along the coast. But public indignation is rapidly forcing a correction of conditions under which raw sewage has been allowed to flow into the sea to pollute areas that otherwise might be fine bathing beaches. Los Angeles, for example, is spending an estimated $40,000,000 for a huge sewage treatment plant at Hyperion which the city confidently expects will remove completely all pollution from the sewer outfall and thereby restore to public use miles of beaches many years under quarantine. Oakland, Berkeley, and other Eastbay communities have joined forces to build a long needed sewage treatment plant which is a major step toward making San Francisco Bay waters again fit for recreational uses. Similar improvements have been completed or are in prospect along the ocean front where other communities direct their sewer outfalls into the sea.

More stringent enforcement of local and state laws is helping to cure sea captains of their former nonchalance in dumping oily bilge wherever they chose along the coast, even though such recklessness frequently ruined for a long time valuable beach frontages. The problem of oil pollution from drilling operations is more difficult to cope with, but this too is being studied. Modern

Destructive force of the ocean waves is shown in this view along the Los Angeles city beach near Venice. After washing away the sand beach which acted as a buffer to protect adjoining homes and other buildings, the ocean was able to break up the boardwalk and inundate houses. (Shoreline Planning Association, Inc.)

methods of whipstock drilling under which it is possible to locate an oil derrick at some distance from the shore and slant-drill the well down into oil-bearing sands under the ocean have afforded valuable aid in eliminating this type of pollution.

In the plan to make California's beaches still more beautiful and useful, old ideas must give way to new. Old piers, badly planned breakwaters, and other obstructions must be removed to return the ocean front to its glory, and offer unobstructed vistas of sand, surf, rock, and cliff.

Thought must also be given to beach access roads. Along many portions of the California coast line major highways parallel the beaches,

LEFT: *Hydraulic jacks are sluicing sand dunes down into pipe lines to be pumped, sometimes for miles, to beach widening projects. This sand dune area is the site of Los Angeles' huge new Hyperion Beach sewage treatment plant which will end one serious form of pollution at Santa Monica Bay beaches.* RIGHT: *This new sewage outfall line will carry treated sewage a mile out to sea. (Los Angeles City Recreation and Parks Department)*

but in other sections there is little opportunity for the motorist to get down to the shore unless he is willing to leave his car behind and do some fancy scrambling. Even the main coastal highways do not solve all access problems, having been built primarily to facilitate through traffic rather than to furnish approaches to the beach. Off-highway side roads leading to beach parking areas are required. Also needed are new arteries some distance back from the beach to take over through traffic and release the beach-front road for the single purpose of serving those who come down to the sea for recreation.

Legal Tangles

Not the least of the major problems have been the legal. A serious blow to the development of California's ocean playgrounds was dealt by the United States Supreme Court when it held that the tidelands heretofore considered under state ownership actually belong to the Federal government. This decision has enormously complicated matters for California, as it has for other states bordering the sea. It has created great uncertainty for the future of the beach development program in at least two ways. The first is financial, since 70 per cent of the state's oil royalties from drilling operations in the tidelands go into the beach and park fund. Loss of this increment is now threatened if the tidelands revert to Federal jurisdiction —$4,000,000 a year from beach and park development with no other funds in sight, for the present at least, to replace it. An even more important effect of the Supreme Court decision has been that of raising serious questions regarding the ability of cities, counties, or states to carry out projected physical developments of their beaches. Local agencies cannot be expected to put large sums into the development of areas where land ownership remains in question.

LEFT: *Teahwhit Head near Lapush, Washington, a few miles south of the Strait of Juan de Fuca. (Photograph by Don Ollis)*

RIGHT: *Sand beach inclosing a lagoon, near Eureka, Humboldt County, California. (Photograph by Gabriel Moulin Studios, San Francisco)*

While the need of huge population centers like Los Angeles is clearly for mass recreation facilities such as are afforded by southern California's bountifully numerous and extensive sand beaches and relatively warm ocean water, there is also a need for wild beaches. Between the headlands and reefs of the more rugged northern coast of California, Oregon, and Washington, lie many beaches—some large, accessible to many people, many small, wild, difficult of approach. On these latter, with their enclosing rocks, reefs, and jutting headlands, nature can and should be left undisturbed. To them go the few: the students of tidepool and dune life; observers of shore and ocean birds; geologists; surf-fishermen; plain wilderness lovers, and beachcombers who rejoice in a jumbled line of driftwood—any and all who are happiest apart from crowds, who abhor "improvement" and need no "facilities." Their needs are legitimate, too. Among them, indeed, are many of the truest conservationists, and none of the exploiters.

A remedy for such problems is potentially at hand in various moves that have been made seeking to have the Federal government quit-claim the ocean tidelands back to the states. These efforts got nowhere in 1948, but their objective cannot be ruled out as a possibility for Congressional action in 1949.

The Legislative Front

On the California legislative front, attention is being given to extending the state's activities in the field of beach acquisition and development. In 1947 a bill was introduced in the State Legislature calling for a comprehensive coast-wide program of beach acquisition, upland beach parks, and small craft harbors from Oregon to the Mexican border. The bill called for an appropriation of $25,000,000 for acquisition and development, for erosion control, for the construction of small boat harbors, and for other work. The bill, which had the sponsorship of the Shoreline Planning Association, did not pass, but its effect was considered "educational." There is hope on the part of beach leaders that a similar or even better bill may have greater success in the 1949 session of the Legislature.

California has come a long way in the past ten or fifteen years toward understanding the great value of its shore-front playgrounds in the recreational life of its people and in the enrichment of the state through increased tourist business. If all projects now in the idea stage should be actually set in motion, the state and its cities and counties may well spend $200,000,000 or more in the next several years for beach acquisition, development, and improvement. There is no longer any question that such an investment would be a wise one, for it would yield returns measurable not only in wealth but in greater health and happiness for a vast and growing number of people.

CHINA: THE LAND AND THE PEOPLE. By Gerald F. Winfield. William Sloane Associates, Inc., New York. 1948. vii + 437 pp., 16 pp. of photographs. $5.00.

Do not let the commonplace title of this volume deceive you into thinking that it is a commonplace book. It is an authoritative and distinguished work, packed full of reliable information about China, enlivened by anecdote and personal narrative, and illuminated by the author's deep understanding of and affection for the Chinese people. It is, moreover, a work of unusual artistry and literary merit, in which the author is able to express his ideal of American democracy and to lash out at anti-Semitism and racial bigotry without for a moment seeming to lose the thread of his discourse about China.

From the first page, which describes the great victory celebration in Chungking on September 3, 1945, to the last page, which leaves us with an unforgettable picture of a Chinese beggar, aged and ill, dying alone in the darkness and rain of an autumn night, Dr. Winfield's account of China's travail moves forward with the dramatic force and the relentlessness of Greek tragedy. The artistic unity of the book derives from the author's genuine belief in the oneness of mankind, and his conviction that anybody's trouble is everybody's trouble. "The bitter truth is that there is no way to create permanent security for a unit of the human race while denying the problems created by that two-thirds of mankind which exists on the bare survival line."

Born in Texas in 1908, Gerald F. Winfield graduated from Southern Methodist University in 1928 and obtained the degree of Doctor of Science from Johns Hopkins in 1932. The following year he became professor of biology in Cheloo University, Tsinan, China, which post he held until the vicissitudes of war pushed him into a variety of other occupations. He learned the Chinese language. He mingled with the Chinese people, not only in the classroom but in the villages and on the farms. With assistance from the Rockefeller Foundation, he studied public health problems. Most of his adult life his preoccupation has been the health and welfare of the Chinese. He is accordingly in a position to speak with some degree of authority on a situation with which he has been in intimate contact for considerably more than a decade. His views are in interesting contrast to those of a variety of journalists who have told us glibly that Chinese Communism is not really Communism, but just a kind of agrarian reform. Says Dr. Winfield:

"The Chinese Communists are Communists. Their basic long-term policies are directed toward the achievement of a proletarian revolution for the purpose of gaining control of the state. In this program they have the backing of the Communist parties and fellow-traveler groups of the world and the active moral and material support of the Soviet Union."

But Dr. Winfield's appraisal of and obvious dislike for Chinese Communism is not based on any enthusiasm for the Chinese Nationalists. "Stated simply and bluntly," he says, 'the dominating fact is that a thoroughly ruthless struggle for power is being fought by two groups . . . This struggle is more complicated and more difficult to check because it is played upon by forces outside China, and because it ranges across all fronts, military, economic, political, and social."

He has no quick and easy solution to propose. His views on population and food supply will be found to be much more in accord with those of Fairfield Osborn and William Vogt than with the vapid optimism of *Time* magazine (see *Pacific Discovery*, Vol. I, No. 6, p. 28) and some of our Sunday supplements. "The truth is that there is no simple, no easy, no quick solution . . . In the titanic problems they face in Asia, not only the Chinese, but all men are on trial, and ultimately the survival of Western civilization hangs on the outcome."

ROBERT CUNNINGHAM MILLER

California Academy of Sciences
San Francisco

MAMMALS OF LAKE TAHOE. By Robert T. Orr. California Academy of Sciences, San Francisco. 1949. 127 pp., 36 drawings, endpaper map. $4.00.

In 1849 few save the local Indians and Frémont's exploring party had seen Lake Tahoe. Its mammals were undisturbed and unknown. A century later the Lake has become a resort for thousands of people, some of whom have an interest in the native animal life. Meanwhile Dr. Orr, the Academy's Curator of Mammals, and other naturalists have accumulated a fair knowledge of the furry inhabitants, large and small, that live around Lake Tahoe and in other parts of the California Sierra. From this material the author has distilled a popular handbook of the 53 native mammals.

Short introductory chapters describe the Lake Tahoe region, discuss the manner of classifying mammals, and include a key to the local species, based mainly on external characteristics. The species chapters provide brief descriptions of the mammals, their general and local distribution, and their habits. Pen sketches, in dark key, by Patritia and George Mattson, illustrate the commoner species and some of the rarer but noteworthy forms, so that laymen may readily identify any of the mammals they chance to see.

While most of the text is in easy non-technical language, there are a few lapses into "zoölogical jargon" which might have been avoided and thus render the short glossary unnecessary. No mention is made of the role of squirrels and chipmunks as vectors of human disease, although there have been cases of both plague and relapsing fever at Tahoe; readers should have been cautioned not to fraternize too closely with these rodents. The bibliography omits a paper on "Some rodent populations in the Sierra Nevada of California" (Storer, Evans and Palmer, *Ecological Monographs*, 14: 165–1944) that affords results of studies at Lake Tahoe.

This volume is a useful addition to the small but growing popular literature on California mammals, and should be on the library tables of vacationists at Lake Tahoe and elsewhere in the Sierra Nevada.

TRACY I. STORER

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THE FLIGHT OF BIRDS. By John H. Storer. Bulletin 28, Cranbrook Institute of Science, Bloomfield Hills, Michigan. 1948. xi + 94 pp., frontispiece, 3 tables and 176 text figs., including half-tones and line drawings. $2.50.

In this work the author begins with a review of the characteristics of air and the basic principles of aerodynamics. These same principles of lift, drag, pressure distribution, tip vortex, and aspect ratio that are used in aviation also apply to bird flight.

Consideration is given to the structure of feathers and of the wing. Different parts of the wing perform different functions. The inner half, from the shoulder to the wrist, is analogous to the wing of a plane and supplies the necessary lift in flight. The outer half, from the wrist to the tip, serves as the propelling force. Although the latter part of the wing differs in function from a propeller in that it can swing only through a semicircle, nevertheless it possesses greater versatility. It is not only capable of producing a forward drive but may, on occasions, go into reverse, function as a helicopter blade for vertical lift or, in gliding, perform the same function as the inner part of the wing.

No two types of birds fly the same way but all make use of the same principles in achieving aërial locomotion. The differences result from the development of wing best adapted to the manner of life of each particular species. A hummingbird's wing is mainly propeller. Such a wing in a small, light species allows for high maneuverability and control. However, it would not meet the needs of larger, heavy fliers where lift is so important.

The author discusses certain special complications concerned with take-off and landing. The explanation of these and other problems, such as those encountered by oceanic gliders, is greatly facilitated in the text by numerous action pictures taken with a high-speed camera.

A table listing the speed of birds under various conditions adds considerable to that published by Cook in 1937. The list of references is unfortunately small and fails to include a number of important papers and books on the subject. The reader will, however, find this volume attractive, interesting, and one that presents sound physical explanations of many of the problems surrounding bird flight. Both the author and the Cranbook Institute of Science are to be highly commended for this contribution to avian literature.

ROBERT T. ORR

Department of Birds and Mammals
California Academy of Sciences
San Francisco

Shall It Be This?

Some of the finest of the great Redwood forests are in line with logging operations. It is urgent to save them now before it is too late.

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FIELDBOOK OF NATURAL HISTORY. By E. Laurence Palmer. McGraw-Hill Book Company, Inc., New York. 1949. x + 664 pp., illustrated. $5.00.

The reviewer takes a long breath as he sits down to describe what is indeed "in one convenient volume . . . an extraordinarily comprehensive guide to natural history." For the professor of nature and science education in Cornell University sat himself down for more than ten years to write a virtual encyclopedia of the natural world, embracing "birds, fish, plants, rocks and minerals, the stars, mollusks, reptiles, and animals," protozoans, and insects—in brief, to list the principal subdivisions: "The Sky at Night," "The Solar System," "The Mineral Kingdom," "The Plant Kingdom," "The Animal Kingdom."

The first part presents a general chart of the northern hemisphere constellations and principal stars, followed by 10 charts of small sections of the sky. Each is accompanied by a half page of matter mostly concerned with magnitudes, periods, etc., of stars comprising the constellations. Next is a chart showing dimensions and compositions of the various concentric layers, above and below the surface, making up our earth – atmosphere, lithosphere, centrosphere. Then comes a diagram of areas and phases of the moon, followed by three pages of tabulated facts (location, size, light and other relations, movement, sidereal day, climate, weight variation, moons) about the sun and its 10 major planets (here we learn that the sun "has no moons").

"The Mineral Kingdom" summarizes physical facts about "atmosphere and hydrosphere and loose mantle materials," "unconsolidated materials," "sedimentary rocks," "metamorphic rocks," "igneous rocks," "extrusive rocks," then gives characteristics and uses of 33 common minerals (muddy half-tones illustrating this section are of doubtful value in recognition).

"The Plant Kingdom" and "The Animal Kingdom" divide the remaining more than 90 per cent of the book between them, except for the 22-page, triple column index. Main feature of these two largest sections is the hundreds of line drawings of both domestic and wild plants and animals. Most of these are excellent, a very few so poor that none might have been better. Nevertheless, to the corps of artists mentioned in the author's "Acknowledgments" must go a goodly share of credit for the usefulness of the book. (Most of the seashells, by the way, are portrayed by too-dark half-tones.) Descriptive text is set 6 point solid, three columns to the page.

Despite its title, it may be safe to predict this unique book will find its greatest use in classrooms, on reference shelves, on the desks of writers on natural history subjects—not in the field, where it cannot supplant the compact popular handbooks which are far more comprehensive in their respective branches. This editor expects to make much use of it. D.G.K.

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